Year 4

Conceptual narrative Science: The Earth's surface

In the Earth and space sciences sub-strand, there are two main conceptual threads being developed from Foundation through to Year 10, Earth in space and the Earth's surface.

Big ideas

Features of the Earth's surface result from past changes.

What concepts do I want my students to understand?

- Wind and water erode soil.
- Humans can affect this process.
- Living things can be preserved in rocks as fossils.

Appendix 1 shows how the three interwoven strands, Science Understanding, Science as a Human Endeavour and Science Inquiry Skills, work together to build the sophistication and complexity of the science concepts from Foundation to Year 10.

This conceptual narrative illustrates one of the nine science concepts from the Australian Curriculum: Science Content structure. It tells the story of the concept in isolation of the eight others. However, there are situations when it is advisable to teach both concepts (Earth in space and the Earth's surface) together, because they complement each other.

Note: Not all concepts are specifically addressed in each year level.

Introduction

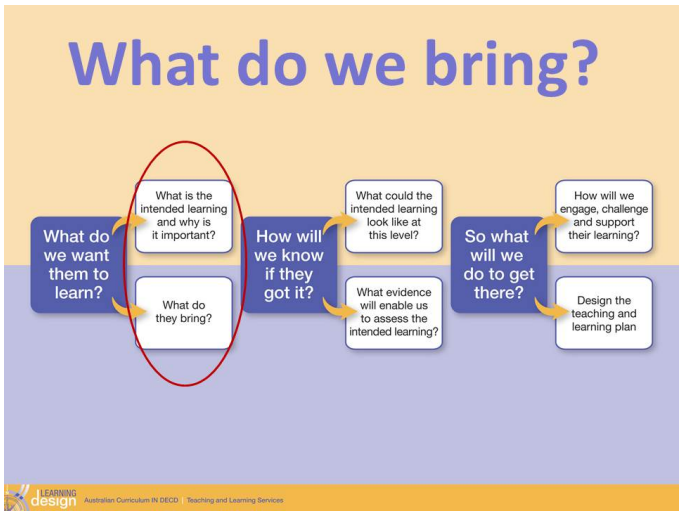
What might my students already know about this concept?

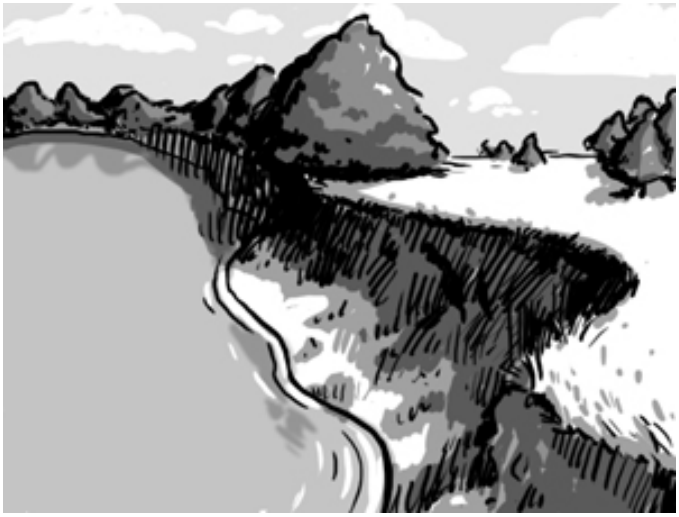
Students will be aware that living and non-living things in the environment change over time. Resources like water move through the environment.

What content could I use to explore this concept?

We could explore this by looking at fossils, a local eroded site or the effects of floods or other extreme weather on the landscape.

Now to bring the essence of scientific understanding to life, let's think about this concept through the six questions from the Bringing it to Life tool (BitL).





In Year 4, we want our students to understand how the Earth's surface changes over time as a result of natural and human actions.

Year 4 example

In this example, students will explore a local area that has changed as a result of natural processes, such as an eroded gully, sand dunes or river bank erosion.

What do you notice?

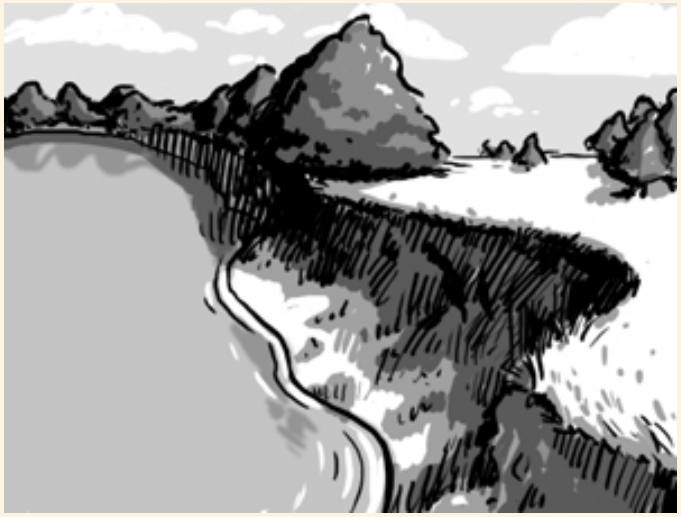
How can I help my students make observations?

Using the BitL questions, I could ask:

- *What do you notice?*

At Year 4, I want my students to make observations about the features of the river bank and how its form might have changed. I would take my students to the local area and ask:

- *What do you observe about the river bank?*
- *What do you notice about the shape of the river?*
- *Which features might have changed over time?*
- *What evidence of change is there?*
- *What is interesting?*



What patterns and relationships can you see

How can i help students to see patterns and relationships? What questions might my students ask?

Student's curiosity leads them to ask questions. These questions help students to order their findings into a pattern to be able to make comparisons or find relationships. These questions support students to be more precise and foster analysis and classification of the observations.

Using the BitL questions, I could ask:

- *What patterns and relationships can you see?*

At Year 4, I want my students to use prior knowledge to link their observations of the features of the river bank to possible past changes. i might ask:

- *Is there anything unusual?*
- *What is happening to the river over time? Are there any changes?*
- *What is the relationship between human activity and the changes in the river?*
- *What features do you see in all rivers?*
- *Are there any exceptions?*
- *What questions do you have?*

What do you think if?

How can I help students to identify and formulate investigable questions?

Students ask testable questions that help them to narrow the focus of the inquiry. These questions provide opportunities for students to make predictions.

Using the BitL questions, I could ask:

- *What do you think if...?*

I want my students to predict how the relationships might change within a system. For example:

- *What do you think might happen if there was a drought? A flood? If people built a dam over the river?*
- *What would be affected by these changes?*
- *How is the effect of fast flowing water different from slow flowing water?*
- *What do you think if the river bed was made of different material (like rock or stone)?*

How can you explore?

These questions support students to develop science inquiry skills and problem solve.

Using the BitL questions, I could ask:

- *How can you explore?*

At Year 4, I want my students to start planning and conducting investigations. Questions I could ask the students are:

- *How could you answer your questions?*
- *How can we explore the erosion of river banks?*
- *How might you find out how river features change over time?*
- *What ideas have you got?*
- *What is your best idea? Is it safe to try this? Could you try it in a different way?*

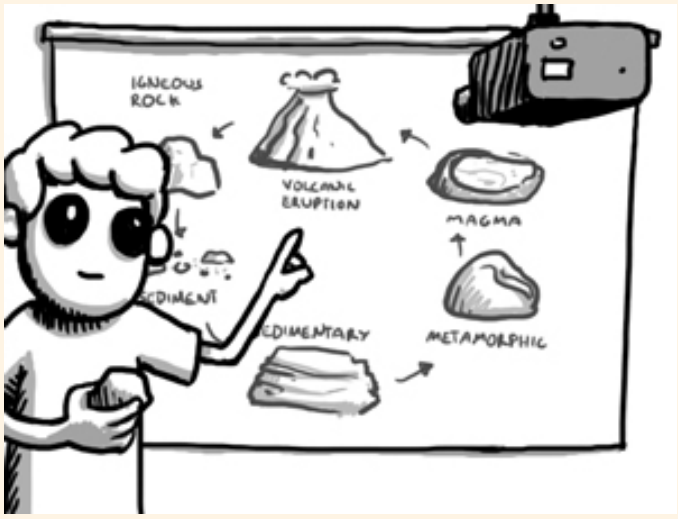
How can you review and communicate?

How can I help students share their observations and questions?

These questions stimulate student's reasoning and help them analyse, draw conclusions and make generalisations about the concepts.

Using the BitL questions, I could ask:

- *How can you review and communicate?*
- *How can you share the information you found with your classmates?*
- *What tools (list, table, graph and drawing) might you use to identify patterns and share this information?*
- *Did other people find something different to you?*
- *Was what you found the same or different from what you predicted? How?*
- *How could you improve your investigation?*



So what? What next?

How can I help students apply the concepts in a range of authentic contexts?

These questions support student's reasoning, to expand or change their ideas from their experience and evidence and generalise to new contexts.

Using the BitL questions, I could ask:

- *So what? What next?*
- *Why is it important to know about the way that natural and human actions might change a river or river bank?*
- *How does understanding this help us to understand and protect our environment?*
- *Who might be interested in this information?*
- *What else could you investigate?*

Concluding comments

What concepts might students develop through working with the BitL questions in this way?

By exploring this science understanding through these questions, we can help our students to be able to think, work and process scientifically. Students can connect science to their world and consider why they need to learn that both natural and human activity can cause changes to the Earth's surface?

Appendix 1

Appendix 1 shows how the three interwoven strands, Science Understanding, Science as a Human Endeavour and Science Inquiry Skills, work together to build the sophistication and complexity of the science concepts from Foundation to Year 10.

This conceptual narrative illustrates one of the nine science concepts from the Australian Curriculum: Science Content structure. These concepts develop in depth and breadth of understanding from Foundation to Year 10. This conceptual narrative tells the story of the concept in isolation of the eight others. However, there are situations when it is advisable to teach both concepts (Earth in space and the Earth's surface) together, because they complement each other.

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Earth and space sciences

In the Earth and space sciences sub-strand, there are two main conceptual threads being developed from Foundation through to Year 10. They are the concepts Earth in space and the Earth's surface. Let's look at the concept the Earth's surface.

Foundation

This begins in the Foundation year with students linking the weather to the effects it has on their daily life, for example how the weather can determine what clothing they wear.

Year 1

In Year 1, students observe changes in the landscape, such as water evaporating from a puddle or a sand castle washing away after the tide comes in.

Year 2

In Year 2, students focus on how we use resources from the Earth, including water. We want students to understand how they use water so they can identify ways to conserve water.

Year 4

At Year 4, students look at a range of changes to the surface of the Earth over time. Students group these changes as those caused by natural agents such as erosion or by human activity such as deforestation.

Year 6

In Year 6, students learn that sudden geological changes like earthquakes and volcanoes, and extreme weather conditions like hurricanes can affect the Earth's surface.

Year 7

In Year 7, students group the Earth's resources as renewable or non-renewable. For example, students can compare fossil fuels which take millions of years to form with wood that grows in decades and biofuel that grows in months. They also learn about the water cycle and that water is as an important resource.

Year 8

In Year 8, students develop an understanding of the rock cycle. They consider the timescale of the processes and formation of igneous, sedimentary and metamorphic rocks. Students also learn that rocks are made up of minerals.

Year 9

When students are in Year 9, they use the theory of plate tectonics to explain how major continental plate movement predicts areas prone to earthquakes and volcanic activity. Students identify global patterns of geological activity, such as considering the role of heat energy and convection currents in the movement of tectonic plates, and relating the extreme age and stability of a large part of the Australian continent to its plate tectonic history.

Year 10

In Year 10, students understand the connections between the different systems that make up the surface of the Earth. They appreciate how cycles of carbon and other materials involve interactions in the hydrosphere, lithosphere, atmosphere and biosphere. Students learn the role of carbon in the greenhouse effect and its effects on biodiversity.

So from Foundation to Year 10, students broaden and deepen their understanding by building on from their thinking about changes in their immediate surroundings, to consider those in the wider world, and then use models and theories to describe, explain, predict and generalise.